WIRELESS PHASE I & II FEATURES & FUNCTIONS Operational Information Document

NENA Wireless Phase I & II Features and Functions Operational Information Document

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1. Executive Overview

The purpose of this Operational Information Document is to define how E9-1-1 Phase I and Phase II should work in a best practice operational environment, given the current technology limitations.

2. Introduction

2.1 Purpose and Scope of Document

The purpose of this Operational Information Document is to define how E9-1-1 Phase I and Phase II should work in a best practice operational environment, given the current technology limitations.

2.2 Reason to Implement

The reason to implement is to allow PSAPs to operate more efficiently and effectively by receiving standard data formats and common data from all wireline and wireless carriers providing E9-1-1 Phase I and II service.

2.3 Reason for Reissue

NENA reserves the right to modify this document. Whenever it is reissued, the reason(s) will be provided in this paragraph.

Document Number	Approval Date	Reason For Issue/Reissue
NENA 57-501	January 20, 2003	Initial Document
NENA-STA-054.1.1-2024, formerly 57-001.1	October 1, 2024	Reaffirmation. Minor updates include new document number assignment, addition of Reason for Issue/Reissue table for document tracking purposes, and update to webpage link for Glossary in Section 2.6.

2.4 Recommendation for Standards Development Work

Yes, there is a need for both technical standards development work and operational standards development work for this topic. Several items are listed below that need additional work.

a. The workgroup would like the Technical Committee to look at technical feasibility or need for PSAPs to receive some Phase I type data with Phase II data, in particular for PSAPs to get the cell site location description along with the handset latitude and longitude. Since some carriers or some technologies are currently not capable of delivering the Phase I cell site location data at the same time as the Phase II data, it will require clarifications to the FCC's Order and to J-STD-036. Once clarified, time will be required for vendor(s) software development.
b. The workgroup would like the Technical Committee to research the need of an "updated location" indicator. This indicator would appear after a re-bid has occurred and tells the call

taker that a location update has been provided and whether that update has changed from the previous location provided.

c. The workgroup would like the Technical Committee to look at standard MSAG addressing across jurisdictional boundaries so when 911 calls are transferred to another PSAP, they can display on their map. Standard addressing would include what is contained in the street address field and abbreviations. Also, the NENA/APCO abbreviations need to be synched up with postal standards.
d. The workgroup would like to participate in a joint effort with the Data Committee to look at recommendations on what ALI fields are best used for specific wireless data items, what should appear for Phase I versus Phase II, and the system logic required to provide the needed combination of wireless-related data.
e. The workgroup requests that the Wireless Technical Committee adopt a definition for 20 digit NCAS which utilizes ESRK and Call-back number with those 20 digits being sent to the PSAP. The PSAP should be able to utilize the "one-button" call back feature and should bid the ALI using the ESRK. Mid-call location updates should also be allowed using the ESRK.
f. The workgroup requests that the Technical Committee investigate the feasibility and define requirements for sending an indicator to the PSAP that updated location information is available at the MPC.
g. In conjunction with the use of XML, investigate and define requirements for a single connection point to a gateway rather than a PSAP to have connections to multiple platforms, carriers, and vendors. The gateway is then responsible for managing the connections to the multiple platforms, carriers, and vendors. The gateway will also have the ability to route the data received to the correct PSAP.
h. Investigate feasibility of passing the PSAP a handset indicator. The indicator would tell the PSAP if the phone being used by the 9-1-1 caller were a location capable phone or not. Without this indicator, the PSAP has no way of knowing if re-bids would produce any more accurate location on a particular caller. The indicator would also take away some of the guess work from the call taker if several re-bids have been made and no updated location is provided.
i. Investigate the feasibility of getting altitude when it becomes available.

2.5 Cost Factors

Not applicable at this time.

2.6 Acronyms/Abbreviations

Some acronyms/abbreviations used in this document have not yet been included in the master glossary. After initial approval of this document, they will be included. Link to the master glossary is located at https://kb.nena.org/wiki/Category:Glossary.

The following Acronyms are used in this document:

- ACN = Automatic Collision Notification
- ESRD = Emergency Services Routing Digits
- ESRK = Emergency Services Routing Key
- FCC = Federal Communications Commission
- GPS = Global Positioning System
- MPC = Mobile Positioning Center
- NCAS = Non-Call Path Associated Signaling
- NOCC = Network Operations Control Center (for wireless carriers)
- PDE = Positioning Determining Equipment
- XML = Extensible Mark-up Language

3. OPERATIONAL DESCRIPTION

3.1 PHASE I

For E9-1-1 Phase I, the FCC requires the wireless carriers to deliver to the appropriate PSAP the telephone number of the handset originating the 9-1-1 call (callback number) and the location of the cell site/sector receiving the 9-1-1 call.

3.1.1 CALL BACK NUMBER

The best practice for PSAP operations is to get the call back number through the voice path including NCAS wireline compatibility mode, if possible. If the PSAP can support receipt of 20 digits, the call back number through the voice path has the following benefits:

- Allows for one button call back capability
- Allows for call back of 9-1-1 caller even when PSAP is experiencing ALI retrieval problems

NOTE: An addition or clarification to J-STD-036 is needed in order to allow for 20 digit NCAS. Also, this best practice is not supportable at this time; equipment and/or software upgrades would be required by wireless carriers (or their MPC providers), some LECs and many PSAPs in order to support this best practice. Twenty-digit NCAS would allow for the delivery of the caller's MDN and the ESRK. The call back number would be used by the PSAP for "one-button call-back", but the bid to the ALI would be made using the ESRK. This solution would also allow for mid-call location updates using the ESRK.

NOTE ON CALL BACK NUMBER: Current FCC regulations require all wireless carriers to

complete all 911 calls, even those originating from unregistered or deactivated handsets. While unregistered or deactivated handsets are capable of making a 911 call (as long as they have a power source), these handsets do not have valid phone numbers assigned to them. As a result, PSAPs will not receive a usable call back number, and the 911 caller will not be able to give the call taker a callback number

3.1.2 CELL SITE/SECTOR LOCATION

Currently, PSAPs have not adopted a standard format for the display of wireless E9-1-1 Phase I data on the call-taker's CPE. The following data elements should be made available to the PSAP to utilize in the screen display. Each PSAP should be able to determine what data is displayed and where it appears on call-taker's CPE. Only one ALI server data transmission format would be in use by all wireless carriers to a particular PSAP center or geographical grouping of PSAPs.
The required wireless E9-1-1 Phase I data elements are:

- Telephone number of handset originating 9-1-1 call (call back number)
- Location of cell site – The PSAP center has the option of choosing from the following location description formats:
  - Street address of cell site with cell face directional (e.g. NNW, NW, ESE, SE, Omni or 1all, etc.),
    - Street address may include any or all of the following: house #, house # suffix (includes 1/2s), prefix street directional, street name, street suffix, and post street directional.
    - PSAP may want to put cell face directionals in a separate routable field and not include in street address field in order to reduce confusion with street directionals and duplication of entries.
  - Cross streets and cell face directionals,
  - Cell site number with face,
  - Extended cell site ID, if wireless carrier utilizes in its network. Extended cell site ID is used by some carriers to uniquely identify an individual cell site in its network, or
  - Combination of the above.

The optional wireless E9-1-1 Phase I data elements are:

- Company ID2 (e.g. NENA Wireless Carrier ID)
- Wireless Carrier Name
- ESRK or ESRD
- Class of Service
- Cell Site Centroid latitude & longitude (The ALI should provide the PSAP the option of not displaying the centroid lat/long if Class of Service indicates it is Phase I data).
- Cell/Sector ID code for troubleshooting between the PSAP and the carrier.
- Cell site longitude (X) & latitude (Y) - (The ALI should provide the PSAP the option of not displaying the cell site lat/long if Class of Service indicates it is Phase I data).

3.1.3 STANDARD ALI DATA FORMATS

The best practice is to standardize what information is sent in specific fields. The best practice would also allow PSAPs to customize what data is seen and its placement on the screen. The NENA Data Exchange Format Version 4 (XML tagged data) can be used for this purpose, but the ability to customize data receipt and placement on the screen must not be dependent on the availability of XML. The wireless caller's call back number should appear in the same field on the ALI screen that wireline call back numbers appear (e.g. the ANI field).

3.1.4 CLASS OF SERVICE

Class of Service should be provided to the PSAP for each wireless call and should be specific to the type of data provided by the wireless carrier for an individual call and specific ALI bid. Best Practice would be for the ALI providers to support the following Class of Service indicators:

- MOBL = indicates a wireless call that is neither Phase 1 nor Phase 2. The call can be either Basic (no location or call back number) or Phase 0.5 (receive location but no call back number).
- WRLS = indicates that Phase 1 location data is being provided from a Phase 1 capable cell site.
- WPH1 = indicates that Phase 1 location data is being provided from a Phase 2 capable cell site.
- WPH2 = indicates that Phase 2 location data is being provided from a Phase 2 capable cell sector.

3.1.5 TROUBLESHOOTING

Before a PSAP has launched E9-1-1 service with a wireless carrier, the PSAP should schedule a joint planning meeting with the PSAP, the wireless carrier, and the 911 service provider to talk about emergency procedures, emergency contacts for the different types of issues, and escalation processes. PSAPs should periodically call the emergency contact numbers to ensure that numbers are still valid. Wireless carriers should ensure that changes or updates to emergency contact numbers be sent to NENA and APCO for updating on their web site.

Emergency contacts may differ depending on the issue. Examples of issues and the possible contact are as follows:

- Issue: PSAP is getting 9-1-1 calls routed to them from cell sites outside of their jurisdiction.

  Possible Contact: The PSAP should contact the wireless carrier or the carrier's third party service provider. Depending on the carrier, the contact could be in the wireless carrier's NOCC, someone in Network Field Operations, the carrier's third party service provider, or someone in an E911 implementation group. The contact may vary depending on if the PSAP is getting basic 911 or enhanced 911.

- Issue: PSAP is getting 9-1-1 calls with no information and the PSAP has implemented wireless E9-1-1 Phase I.

  Possible Contact: The PSAP should contact the wireless carrier because it is likely that a new cell site has been turned up without going through the Phase I implementation process. Depending on the carrier, the contact could be in their NOCC, someone in Network Field Operations, the carrier's third party service provider, or someone in an E911 implementation group.

- Issue: PSAP is getting misrouted 911 calls.

  Possible Contact: The PSAP should contact the wireless carrier or the carrier's third party service provider. Depending on the carrier, the contact could be in the wireless carrier's NOCC, someone in Network Field Operations, the carrier's third party service provider, or someone in an E911 implementation group. The contact may vary depending on if the PSAP is getting basic 911 or enhanced 911.

- Issue: PSAP's ALI connection is down or sporadic.

  Possible Contact: The PSAP's 911 service provider is the likely contact. The service provider would then work back with any third party database providers, if necessary.

- Issue: PSAP is getting no caller/location data or only partial caller/location data.

  Possible Contact: The 911 service provider is the likely contact. The 911 service provider would then work back with the third party service provider, if necessary.

3.2 PHASE II

For E9-1-1 Phase II, the FCC requires the wireless carriers deliver to the appropriate PSAP the telephone number of the handset originating the 9-1-1 call and the latitude and longitude of the call. The accuracy requirement imposed on the wireless carriers by the FCC varies depending on the location technology used by the wireless carrier.

For carriers using a network-based Phase II location technology, the Carrier shall as of October 1, 2001:

- Within 6 months of a PSAP request, carriers employing network-based location technologies must provide phase II information for at least 50 percent of the PSAP's coverage area or population.
- Within 18 months of a PSAP request, carriers must provide phase II information for 100 percent of the PSAP's coverage area or population.

Accuracy and reliability shall be:

- 100 meters for 67 percent of calls
- 300 meters for 95 percent of calls

For carriers using a handset-based Phase II location technology, the Carrier shall:

- Begin selling and activating compliant handsets no later than October 1, 2001
- Ensure that at least 25 percent of all new handsets activated are compliant no later than December 31, 2001
- Ensure that at least 50 percent of all new handsets activated are compliant no later than June 30, 2002
- Ensure that 100 percent of all new digital handset activated are compliant no later than December 31, 2002 and thereafter
- By December 31, 2005, achieve 95 percent penetration of compliant handsets among its subscribers

When a PSAP request has been received, and within 6 Months of the request (or by October 1, 2001, whichever is later), the Carrier shall:

- Install any hardware and/or software in the network and/or other fixed infrastructure, as needed, to enable the provision of Phase II E9-1-1 service
- Begin delivering Phase II E9-1-1 service to the PSAP

Accuracy and reliability shall be:

- 50 meters for 67 percent of calls
- 150 meters for 95 percent of calls

3.2.1 CALL BACK NUMBER

The best practice for PSAP operations is to get the call back number through the voice path including NCAS wireline compatibility mode, if possible. If the PSAP can support receipt of 20 digits, the call back number through the voice path has the following benefits:

- Allows for one button call back capability
- Allows for call back of 9-1-1 caller even when PSAP is experiencing ALI retrieval problems

NOTE: An addition or clarification to J-STD-036 is needed in order to allow for 20 digit NCAS. Also, this best practice is not supportable at this time; equipment and/or software upgrades would be required by wireless carriers (or their MPC providers), some LECs and many PSAPs in order to support this best practice. Twenty-digit NCAS would allow for the delivery of the caller's MDN and the ESRK. The call back number would be used by the PSAP for "one-button call-back", but the bid to the ALI would be made using the ESRK. This solution would also allow for mid-call location updates using the ESRK.

NOTE ON CALL BACK NUMBER: Current FCC regulations require all wireless carriers to complete all 911 calls, even those originating from unregistered or deactivated handsets. While unregistered or deactivated handsets are capable of making a 911 call (as long as they have a power source), these handsets do not have valid phone numbers assigned to them. As a result, PSAPs will not receive a usable call back number, and the 911 caller will not be able to give the call taker a callback number.

3.2.2 LOCATION DATA

It is the best practice to send Phase I location data if the Phase II call location data is not available when the PSAP bids the ALI.

For some carriers or technologies, the current practice is to provide the caller's latitude and longitude when it can be calculated, along with the call back number. If it cannot be calculated, the carrier will provide the Phase I location data as a fallback. Phase I location data will also be provided for caller's with non-location capable phones (in the case of carrier using a handset-based location technology). So, with some carriers' Mobile Positioning Centers, if the caller's latitude and longitude can be calculated, the PSAP will receive that latitude/longitude and will not receive the Phase I cell site location descriptions.

For PSAPs that want some Phase I type data with Phase II data, it is desirable for the PSAPs to get cell site location description along with the handset latitude and longitude. However, for some carriers or some technologies, sending the Phase I cell site location data at the same time as the Phase II data will require clarifications to the FCC's Order and to J-STD-036. Once clarified, time will be required for vendor(s) software development.

3.2.3 PHASE II DATA ELEMENTS

In addition to the Phase I data elements outlined in the "Cell Site/Sector Location" paragraph in the Phase I section of this paper, the following data elements should be made available by the 911 Service Provider to the PSAP to utilize in the screen display for Phase II. Each PSAP should be able to determine what data is displayed and where it appears on call-taker's CPE. Only one ALI server data transmission format would be in use by all wireless carriers to a particular PSAP center or geographical grouping of PSAPs. The wireless E9-1-1 Phase II data elements are:

- Longitude (X) and Latitude (Y) of the caller
- Uncertainty factor (expressed in meters)
- Confidence factor (shown as percentage). Note: Confidence factor should only be used in conjunction with the Uncertainty factor and should never be sent by itself. In addition, the Confidence factor is not standard among the various location technologies. The receipt of Confidence factor should be an optional choice for PSAPs.

  NOTE: Consensus opinion of the PSAPs is that the confidence factor is not useful to the PSAP because it cannot be standardized and therefore, should not be sent to the PSAP. However, the uncertainty factor should always be sent to the PSAP with the Phase II coordinates.

3.2.4 DATA PLACEMENT ON PSAP DISPLAY

The best practice should be to place the Phase II latitude and longitude in separate latitude and longitude fields and not in the street address field. Call back number should be placed in the same field as the wireline call back number. There should be separate fields for the uncertainty factor and the confidence factor (if sent) and that the uncertainty factor should always be displayed on the PSAP call taker's screen. PSAP should have the ability to suppress the cell sector centroid latitude and longitude and/or or cell site latitude and longitude sent with the Phase 1 location description, if desired.

3.2.5 STANDARD ALI DATA FORMATS

The best practice is to standardize what information is sent in specific fields. The best practice would also allow PSAPs to customize what data is seen and its placement on the screen. The NENA Data Exchange Format Version 4 (XML tagged data) can be used for this purpose, but the ability to customize data receipt and placement on the screen must not be dependent on the availability of XML. The wireless caller's call back number should appear in the same field on the ALI screen that wireline call back numbers appear (e.g. the ALI field).

3.2.6 CLASS OF SERVICE

Class of Service should be provided to the PSAP for each wireless call and should be specific to the type of data provided by the wireless carrier for an individual call and specific ALI bid. Best Practice would be for the ALI providers to support the following Class of Service indicators:

- MOBL = indicates a wireless call that is neither Phase 1 nor Phase 2. The call can be either Basic (no location or call back number) or Phase 0.5 (receive location but no call back number).
- WRLS = indicates that Phase 1 location data is being provided from a Phase 1 capable cell site.
- WPH1 = indicates that Phase 1 location data is being provided from a Phase 2 capable cell site.
- WPH2 = indicates that Phase 2 location data is being provided from a Phase 2 capable cell sector. Note: Interim or "quick fixes" would be classified as WPH2. The call taker would need to look at the Uncertainty factor in order to determine if a re-bid for more accurate location is required. Quick fixes are latitudes and longitudes that are available in 3 to 5 seconds and used to route the call. It is also the fix that is generally sent to the PSAP in response to the first ALI bid from the PSAP.

3.2.7 UNCERTAINTY FACTOR/CONFIDENCE FACTOR

The Uncertainty factor is key to the PSAPs being able to ascertain the accuracy of the latitude and longitude being provided to them by the wireless carriers and subsequently, assist in determining where to dispatch emergency help. For example, the default latitude/longitude of the cell sector centroid may have an uncertainty of over 3000 meters while a latitude/longitude provided via the GPS technology may have an uncertainty of 20 meters. Without the Uncertainty factor, the PSAP has no way of distinguishing between those two latitude/longitudes and may incorrectly rely on the inaccurate default latitude and longitude. The Local Exchange Carriers must pass through the Uncertainty factor, when provided, to the PSAP.

Many wireless carrier's PDE (Positioning Determining Equipment) calculate and will send to the Mobile Positioning Center (which returns to ALI) an expression of uncertainty (meters) and/or confidence (percent) along with the 9-1-1 call's latitude and longitude.

Uncertainty, expressed is meters, in an indication of accuracy of the 9-1-1 call latitude and longitude provided to the PSAP. Although not directly a measure of radius, an uncertainty of 80 should be interpreted as a caller location being within an 80 meter radius of the latitude & longitude provided.

Confidence is expressed in percentage. In PDE systems generally available and deployed to date, confidence, when sent to the MPC, is either set at 67% or 95% to indicate whether the location meets the 67% or 95% accuracy measurement required by the FCC. The confidence factor works in conjunction with the uncertainty factor and should never be sent to the PSAP without the corresponding uncertainty factor. For example, if the PSAP is provided with latitude and longitude, a 50 meter uncertainty, and a 95% confidence factor, that indicates that the carrier is 95% confident that the 9-1-1 caller is within an approximate 50 meter radius of the latitude and longitude provided.

The FCC does not require the wireless carrier to provide an uncertainty factor or a confidence factor with the caller's latitude and longitude. Some wireless carriers do not have the capability to support the calculation or delivery of either factor. These factors were included as additional data options for location in J-STD-036. Whether an uncertainty factor and/or a confidence factor is calculated, depends on the wireless carrier's Positioning Determining

Equipment (the equipment that actually calculates the caller's location).

If the wireless carrier calculates and passes the uncertainty factor and/or the confidence factor, it may or may not be passed on by the 911 ALI Service Provider to the PSAP call taker's workstation. The PSAP will need to work with its 911 ALI Service Provider and its CPE provider to ensure that they can receive and utilize these factors.

The best practice for the PSAP is to be able to choose whether or not to receive and utilize the uncertainty and/or confidence factor calculated and passed by the wireless carrier's PDE. The uncertainty factor will be the most useful to the PSAP, because it can be incorporated into the graphical display on the call taker's workstation and provides meaningful measurement of location accuracy from all PDE providers. The confidence factor can be provided in conjunction with the uncertainty factor, but should never be sent without the uncertainty factor.

3.2.8 RE-BID/LOCATION UPDATES

Once queried by the MPC, the PDE is allowed up to 30 seconds to provide a valid Phase II location. In most cases, with current technology, the PDE will not have responded with final Phase II location information to the MPC by the time the call is answered by the PSAP and initial ALI query to the MPC is performed. This makes it necessary for the PSAP to be able to re-bid or re-request their ALI to receive the caller's location information or to receive updated location information. This is currently necessary, because 9-1-1 calls are generally routed in 5 seconds or less and once the call is routed, it usually takes no more than 1 second for the initial ALI bid to be made. If an accurate latitude and longitude cannot be calculated in the 6 or less seconds it takes to route the call and make the initial ALI bid, then the wireless carrier will deliver Phase I type location data. In those cases, the PSAP will then need to re-bid or re-request the ALI approximately 15 to 30 seconds after they receive the initial ALI bid to obtain the 9-1-1 caller's accurate latitude and longitude.

It is best practice to allow PSAPs to make **manual** mid-call location updates. This paper does not support the use of automatic re-bids.

3.2.9 PHASE II ALI INTERFACE

For the near term, the desirable Phase II interface needed between the PSAP's ALI serving node and the third party wireless ALI vendor or the wireless carrier's Mobile Positioning Center, is currently referred to as the E2+. The E2+ interface includes a location description field that is not included in the traditional E2 interface that was defined by J-STD-036. This additional field allows for the passing of the Phase I type location description. Regardless of name, the ALI interface should be able to pass the Phase I location description and call back number along with the handset/caller latitude and longitude and uncertainty factor. The interface should also allow PSAPs to perform periodic mid-call location updates.

Best practice is to move, as soon as possible, to using a standard, non-proprietary XML protocol (based on NENA-02-010) for transporting the ALI data between the PSAP's ALI and a third party

National ALI vendor or the wireless carrier's Mobile Positioning Center. This protocol could be used across multiple platforms such as ACN, wireline, wireless, etc.

3.2.10 TROUBLESHOOTING

The PSAP should update its troubleshooting procedures before it has launched E9-1-1 Phase II service with a wireless carrier. The procedures, contacts, and escalation processes established after launching Phase I will likely remain the same, but some additional procedures or contacts may be necessary to account for the new location data being provided and the new location equipment in the wireless carrier's network.